

CASE STUDY

TRACING THE HEMOPHILIA GENE

Objective

To use pedigree charts to trace the hemophilia gene from Queen Victoria.

Background Information

A pedigree chart provides a means of tracing the inheritance of a particular trait from parents through successive generations of offspring. Hemophilia A is a blood-clotting disorder that occurs in about one in 7000 males. The disorder is associated with a recessive gene located on the X chromosome. The fact that a female must inherit one of the mutated genes from her mother and another of the mutated genes from her father helps explain why this disorder is very rare in females.

Procedure

- 1 Study the pedigree chart of Queen Victoria and Prince Albert. Note the legend. Males are designated by a square, while females are designated by a circle.

- a) Who was Queen Victoria's father?
 - b) How many children did Queen Victoria and Prince Albert have?
- 2 Locate Alice of Hesse and Leopold, Duke of Albany, on the pedigree chart.
 - c) Using the legend, provide the genotypes of both Alice of Hesse and Leopold.
 - 3 Locate the royal family of Russia on the pedigree chart. Alexandra, a descendant of Queen Victoria, married Nikolas II, Czar of Russia. Nikolas and Alexandra had four girls (only Anastasia is shown), and one son, Alexis.
 - d) Explain why Alexis was the only child with hemophilia.

Case-Study Application Questions

- 1 Is it possible for a female to be hemophilic? If not, explain why not. If so, identify a male and female from the pedigree chart who would be capable of producing a hemophilic, female offspring.
- 2 On the basis of probability, calculate the number of Victoria's and Albert's children who would be carriers of the hemophilic trait. ■

